

An Observational Study in Hospital on Bacterial Meningitis in Children: Review

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Submitted: 20-09-2022

Accepted: 30-09-2022

ABSTRACT: Meningitis is defined as inflammation of the membranes that surround the brain and spinal cord. Microbiologic causes include bacteria, viruses, fungi and parasites. Bacterial meningitis has become an uncommon disease in the developed world. Unfortunately, because of limited economic resources and poor living conditions, many countries are affected by the consequences of life-threatening systemic infection. Basic and clinical research is needed to promote new antimicrobial and anti-inflammatory agents to improve outcome from disease.

Keywords: Bacterial meningitis, inflammation, pediatrics, gram-negative bacteria.

I. INTRODUCTION:

Meningitis is a potentially fatal condition brought on by bacterial and viral infections that

inflammate the membranes surrounding the brain and spinal cord. { 1 }

One of this disease's deadliest and most incapacitating forms is acute bacterial meningitis. Infection can start epidemics, inflict death within 24 hours, and leave one in five people permanently disabled. Infection with fungus, parasites, and meningitis can all result in meningitis, with cryptococcal meningitis becoming more prevalent in HIV-positive people. It can also arise from non-infectious causes such as certain medications, cancer, and autoimmune disorders. [1]

Since deaths from all infectious diseases are included in these statistics, estimated cases and deaths from tuberculosis, cryptococcal meningitis, and HIV are not included.

Meningitis is likely to be brought on by acute bacterial infections close to the WHO estimate per global fatalities from meningitis 2015 saw bacterial meningitis [2]

Figure 1

Fig. 1. Global map of incidence rates of all-cause meningitis per 100 000 population by country (7)¹



Despite an excellent immunisation against the three main agents, bacterial meningitis (BM) is the tenth most common mortality in children under the age of five. The places with the slowest socioeconomic development (2-7 mortality compared to India) have the highest incidence, mortality, and sequence rates of BM. [3-7]

The outcome of children BM is significantly impacted by factors at presentation, such as tardiness in reaching hospitals, past seizures, [8] arrival with a low Glasgow coma score, [9] and low weight for age, in addition to in-hospital therapy and aetiology. More promising than new medicines are interventions aiming at improving the outcome of BM by addressing these components. It's not apparent if underweight can be managed the same way in the hospital without having a negative influence on prognosis. [10]

According to data, over 50% of cases of community-acquired acute bacterial meningitis are thought to be caused by *S. pneumoniae*, 25% by *N. meningitidis*, 13% by group B streptococci, 8% by *I. monocytogenes*, and 7% by *H. influenzae*. Up to 33% of the time, enteric gram-negative bacilli are linked to meningitis cases. The gram-negative bacteria that affect adults the most frequently include *Klebsiella/enterobacter SPP* and *E. coli*. [11]

If infant meningitis is not treated, the mortality rate can reach 56%, and the mortality can even reach 100%. Other bacterial diseases, such as coagulase-negative staphylococci, *Burkholderia pseudomallei*, *Pseudomonas aeruginosa*, and other gram-negative bacilli, can occasionally cause acute meningitis. Anaerobic bacteria, viridans streptococci, and *Staphylococcus aureus*. Low immune levels and consequences from neurosurgical procedures might lead to mixed bacterial infections. [12]

EPIDEMIOLOGY AND ETIOLOGY:

The incidence of bacterial meningitis in children differs by age group and is highest in infants aged younger than two months. (11,12) In India the incidence rate during 2021- 2022 in children under two months was 81 cases per 100000 compared with 0.4 cases per 100000 in children aged 11-17 years. Bacterial meningitis is more common in low- and middle-income countries (LMICS) compared to high income countries (HICE). [13-14]

II. MATERIAL AND METHODS:

We retrospectively reviewed the medical records of children patients with laboratory confirmed bacterial meningitis, who were treated in SCPM Hospital from 2021-2022.

According to the guideline of the World Health Organization, meningitis is defined as follows. Any person displaying the clinical indications of bacterial meningitis was considered a suspected case.

Any suspected cases with a cerebrospinal fluid (CSF) white blood cell (WBC) count of greater than 100 cells/mm³ or a CSF WBC level of between 10 and 100 cells/mm³ were considered probable cases.

either a protein level more than 100 mg/DL or Laboratory-verified cases with a glucose level of 40 mg/dl or higher were defined.

If any alleged or likely instances when bacterial pathogens were identical in blood cultures, CSF, or CSF detection of bacterial antigens only bacterial meningitis that was proven in a lab by a later agglutination test case were chosen as the study's subjects and were examined. [15]

CLINICAL INFORMATION:

Demographic data, symptoms and signs at presentation, premorbid functional status, immunocompromised status, concurrent infection, indwelling neurosurgical devices, and recent neurosurgery or head trauma were all examined. Severe mental deterioration at admission was defined as an initial Glasgow coma scale (GCS) score of 8 or higher. At discharge and three months following discharge, we assessed the first CSF profiles, including cell count with differential, using a modified ranking scale (mRS) score. An mRS score of 4 or lower at 3 months was considered a negative result. [16]

CASE IDENTIFICATION:

Inclusion criteria: -

The study included all paediatric cases (0 days to 14 years of age) that began treatment for BM during the study period and were clinically suspected or confirmed to be meningitis. Any of the following symptoms of a serious bacterial infection raised the suspicion of meningitis in the patient. Symptoms of meningeal irritation include lethargy, vomiting (more than three episodes), decreased feeding or the inability to breastfeed, fever (Auxiliary Measurement > 38 C), headache (age > 2 years), and neck shifting (age > 1 year). Seizures made it harder to be conscious (Blantyre

Coma scale: 4 if under 9 months old, 5 if over 9 months old). signs of abnormal pupils and elevated intracranial pressure. Critical signs of meningitis included focal paralysis in any limb and abnormal breathing upon examination. However, lumbar puncture was performed to confirm the diagnosis after the baby was stabilised and antibiotic treatment had begun. [17-18]

Exclusion criteria:

Patients who stopped being followed within 7 days of beginning medication and children whose original diagnosis of BM was later modified to another condition, such as a fungal infection or a viral infection, were excluded from the study. [19]

Short term treatment outcome:

This study defined it as BM outcomes that were only discovered up until discharge. These included both **positive** and **negative** results.

- A **positive outcome** is one without serious complications.
- A indication of improvement: Since fever is the most frequent presenting symptom in patients with BM, normalisation of fever was thought to be a marker of BM improvement [20]. Defined as a fever that lasted longer than 7 days in this study is delayed fever,[21] Other clinical symptoms that afebrile individuals had were monitored for improvement.
- **Negative result:** in-ward death, delayed fever, and development of acute neurologic problems either during treatment or at discharge.

III. CONCLUSION:

Meningitis that is contagious is a serious public health issue. To reduce illness mortality and potentially fatal consequences, continuous diagnosis improvement is required. The

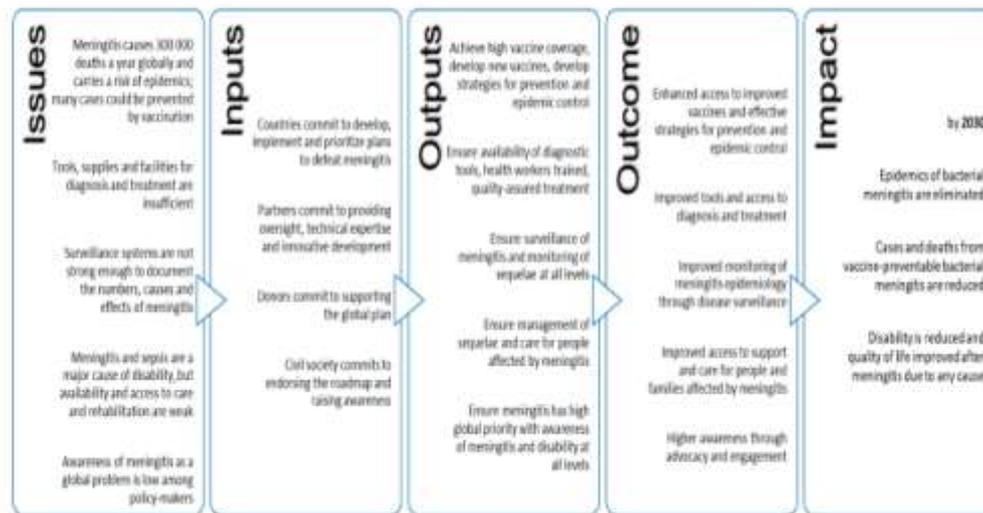
effectiveness and effects of vaccination will be assessed with the support of expanded reporting of outbreaks and ongoing updates on prevalence. Through phylogenetic analysis, viral genotyping in outbreaks aids in the prediction of the formation of new strains by illuminating the epidemiology and geographic spread of the virus [22].

In research published in the last five years, there were significant disparities in the incidence of bacterial meningitis pathogens across a wide range of age groups and geographical regions, as shown by this systematic review and meta-analysis. Future research are required to monitor bacterial meningitis cases and assist the further development of preventative and treatment techniques world wide.

The choice of empiric therapy, modification of the empiric regimen, and timing of the administration of antibiotics for the treatment of childhood BM were almost all in accordance with suggestions for resource-constrained settings. the timing of the change in empiric antibiotics was much longer. Nearly one-fourth of patients who were treated with BM had unsatisfactory results upon discharge. [23]

Last but not least, a few independent predictors of bad outcomes were found. It has been discovered that switching empiric antibiotics throughout therapy can predict poor outcomes in young infants. While drug-related factors, such as starting treatment with a combination of Ceftriaxone and Gentamycin instead of first-line Crystalline penicillin plus Chloramphenicol, and skipping one or more doses of the prescribed antibiotics during the course of treatment, were found to independently increase incidence of poor outcomes in older infants and children with severe clinical presentations characterised by irritability and seizure prior hospital admission.[24]

Fig. 2 Overall framework for the global road map to defeat meningitis by 2030



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